## REMARKS

Prior to this Reply, Claims 1-63 were pending. Through this Reply, Claims 1, 12-14, 27 and 29 have been amended, while Claims 64-101 have been added. Furthermore, Claim 19 has been cancelled without prejudice to, or disclaimer of, the subject matter claimed therein. Accordingly, Claims 1-18 and 20-101 are now at issue in the present case.

The amendments to Claims 1, 12, 14 and 29 are intended to further clarify the differences between the claimed invention and the cited references. The amendments to Claims 13 and 27 are to correct typographical errors.

Further, the specification has been amended as described further below. Marked-up versions of the amended paragraphs in the specification, and the amended claims, are attached hereto.

### I. Allowable Subject Matter

In the Office Action, the Examiner objected to Claims 5, 31-33, 47, 51-54, 59, 60 and 62 as being dependent upon a rejected base claim. However, the Examiner noted that such claims would be deemed allowable if rewritten in independent form to include all of the limitations of their respective base claims and any intervening claims.

New independent Claims 64, 74, 81, 84, 91 and 97 correspond with objected-to Claims 5, 31, 47, 51, 52 and 59, respectively. The remaining new claims depend from one of Claims 64, 74, 81, 84, 91 and 97. Therefore, Applicant believes that new Claims 64-101 are in condition for allowance.

## II. Objections to the Specification

The Office Action includes several objections to the specification. The specification has been amended herein to overcome all objections raised in subparts a-e of paragraph 1, on page 2 of the Office Action. In the specification, the terms "integrator" and "compensator" are used interchangeably.

## III. Claim Objections

Claim 19 was objected as being substantially a duplicate of Claim 15. Claim 19 has been canceled herein to overcome this objection.

## IV. Claim Rejection Under 35 U.S.C. § 112

Claim 12 was rejected under 35 U.S.C. § 112, second paragraph, due to certain informalities. Claim 12 has been amended herein to overcome that rejection.

## V. Claim Rejections Under 35 U.S.C. § 102(b)

Claims 1-3, 6-30, 34-41, 43-46, 48 and 49 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,838,515 to Mortazavi et al. ("Mortazavi"). As noted above, Claim 1 has been amended to further clarify the operation of the transconductance amplifier. As such, the rejected claims should be allowed because Mortazavi does not disclose all of the limitations of the claims.

For example, Mortazavi does not disclose a driver having a current control device for a voice coil motor, comprising a sensor to sense a coil current in said voice coil motor, "a transconductance amplifier to detect an error current by comparing said coil current and a

command current," and a compensator to integrate said error current into said coil current, as required by Claim 1.

In rejecting Claim 1, the Patent Office has relied on Mortazavi, col. 3, lines 59-60 and col. 3, line 66 to col. 4, line 5, for the proposition that Mortazavi discloses all of the limitations of Claim 1. Applicant respectfully disagrees. Specifically, in the cited passages, Mortazavi states:

> "a sense resistor in series with the coil and the H-bridge for sensing coil current, ... a transconductance loop compensation amplifier having an inverting input connected to the VCM driver summing junction, having a non-inverting input connected to a reference level, and having an output control signal node, for providing loop compensation to a control level at the output control signal node ...." col. 3, lines 59-60 and col. 3, line 66 to col. 4, line 5.

Although Mortazavi refers to a transconductance loop compensation amplifier, Mortazavi does not disclose a transconductance amplifier that detects an error current by comparing a sensed coil current and a command current, as required by Claim 1.

Furthermore, in Fig. 2 of Mortazavi, which is relied upon by the Patent Office, Mortazavi does not disclose such a transconductance amplifier. The compensation amplifier 56 in Fig. 2 is not a transconductance amplifier that detects an error current by comparing a sensed coil current and a command current, as required by Claim 1. As such, detecting the error current as claimed herein is by determining the difference between the sensed current and the command current. By contrast, Mortazavi specifically describes that the amplifier 56 is a compensation amplifier that forms an integrator in conjunction with a capacitor C4 and a resistor R3 (col. 6, lines 50-54).

Further, as described by Mortazavi and as shown in Fig. 2, any sense current from amplifier 66 and any command current from the decoder & filter 54 are connected to only one input of the compensation amplifier 56 (col. 6, lines 42-50 and col. 7, lines 47-50). As such, by

definition, the compensation amplifier 56 cannot detect "an error current by comparing said sensed coil current and a command current," as required by Claim 1.

Even further, the compensation amplifier 56 does not generate an error current as claimed herein. And, Mortazavi does not disclose that such a compensator 56 integrates said error current into said coil current.

Therefore, for at least the above reasons, Claim 1, and all its dependent claims, should be allowed.

With respect to Claim 13, Mortazavi does not disclose that "said compensator is coupled to a gain buffer," as required by such claim. In rejecting Claim 13, the Patent Office relies on Mortazavi, col. 7, lines 13-25 and Fig. 1. Applicant disagrees with the Patent Office's characterization of Mortazavi. In the cited passage, Mortazavi states:

> "Preferably, gain of the drivers 62 and 64 is set to be 3, meaning that feedback resistor R9 has three times the resistance of resistor R8, and feedback resistor R7 has twice the resistance of resistor R6. With the arrangement shown in FIG. 2, differential gain of amplifiers 62 and 64 is 6. For example, if the power supply provides 12 volts, and the driver reference voltage Vref is 6 volts, a plus or minus 2 volts as input results in plus or minus maximum current through the motor coil 24...." (col. 7, lines 13-25).

As can be seen, there is no reference to a gain buffer of any sort in that passage. The DRAM Buffer 46, which is referenced by the Patent Office, is a memory device for data transfer to temporarily store data read from, or to be written to, the disk 14 (col. 5, lines 45-51; col. 5, line 63 to col. 6, line 4). Not only is the DRAM Buffer 46 not a gain buffer, but it is not even part of the VCM driver 28 of Mortazavi. As such, Applicant submits the rejection of Claim 13 should be withdrawn.

Claims 14-22 were rejected for substantially the same reasons as rejection of Claims 1-3 and 6-13. Claim 19 has been canceled. Further, Claim 14 has been amended in a similar manner

as Claim 1. As such, Claims 14-18 and 20-22, should be allowed for the reasons similar to those provided above in relation to Claim 1 and its dependent claims, and further for the following reasons.

Mortazavi does not disclose the steps of "determining an error current by comparing said coil current and a command current" in a disk track mode, as required by Claim 14. The Patent Office relies on Mortazavi, col. 4, lines 42-43, wherein Mortazavi mentions the steps of: "amplifying and inverting the sensed VCM current to provide a loop error value." Clearly, this has nothing to do with comparing a sensed coil current and a command current to detect an error current, as required by Claim 14.

Further, Mortazavi does not disclose the steps of "integrating said error current into said coil current," as required by Claim 14. The Patent Office relies on Mortazavi, col. 4, lines 44-45, wherein Mortazavi mentions the steps of: "combining the loop error value with decoded VCM control values at a loop compensation amplifier to produce a compensated control value." Again, this has nothing to do with integrating said error current into said coil current, as required by Claim 14. As such, Applicant submits that the rejection of Claim 14, and all claims dependent therefrom, should be withdrawn.

Further, with respect to Claim 22, Mortazavi does not disclose the steps of "compensating said error current by delaying said integration step," as required by Claim 22. In rejecting Claim 22, the Patent Office relies on Mortazavi, col. 4, lines 44-46. However, the aforementioned limitations of Claim 22 are not disclosed therein. Therefore, for at least for the above reasons, Applicant submits the rejection of Claims 14-18 and 20-22 should be withdrawn.

Claims 23-28 were rejected for rejected for substantially the same reasons as rejection of Claims 1-3 and 6-13. The rejection of Claims 23-28 is respectfully traversed for the reasons

similar to those provided above in relation to Claims 1 and 14, and further for the following reasons.

Mortazavi does not disclose "a compensator circuit to integrate an error current with said command current to generate said coil current, wherein said error current is detected with a sensor coupled between said amplifier and said voice coil motor," as required by Claim 23. The Patent Office states that Item 56 in Fig. 2 of Mortazavi, is an amplifier to drive the voice coil motor with a coil current. However, as discussed above, Mortazavi describes Item 56 as a compensator amplifier, and not an amplifier to drive the voice coil motor with a coil current, as required by Claim 23.

Further, the Patent Office relies on Mortazavi, col. 6, lines 52-54, to conclude that Mortazavi discloses "a compensator to integrate the error current with the command current to generate the coil current and the error current with a sensor" (Office Action page 6, paragraph 5). However, in col. 6, lines 52-54, Mortazavi simply states "... a capacitor C4 and a resistor R3 establishes the compensation amplifier 56 as an integrator and provides suitable loop phase margin during both linear and PWM control modes." As such, an integrator in Mortazavi does not "integrate an error current with said command current to generate said coil current," as required by Claim 23. Therefore, in contrast to the claimed invention, there is no error current detection or integration of the error current with a command current to generate a coil current in Mortazavi. Therefore, at least the above reasons, Applicant submits that the rejection of Claim 23, and all claims dependent therefrom, should be withdrawn.

Claim 29 was rejected for rejected for substantially the same reasons as rejection of Claims 1-3 and 6-13. Claim 29 as been amended in a manner similar to Claim 1. Despite the Patent Office's characterization, Item 64 in Fig. 2 of Mortazavi, Item 64 is not "a

transconductance amplifier coupled to said current sense amplifier to receive said voltage and a command current, wherein said transconductance amplifier calculates an error current by comparing the sense current with the command current," as required by Claim 29. Further, the inputs to Item 64 in Fig. 2 of Mortazavi are not a sense current and a command current, and Item 64 does not compare a sense current with a command current to detect an error current, as required by Claim 29. As such, Claim 29 should be allowed for these reasons, and for the reasons similar to those provided above in relation to the rejection of Claims 1, 14, 28, and their dependent claims.

With respect to Claim 30, Mortazavi does not disclose "a comparator to shape a command current waveform to said coil current waveform" in disk drive seek mode, as required by Claim 30. By contrast, in col. 9, lines 14-19 (relied upon by the Patent Office), Mortazavi states "[t]he absolute value (full-wave rectified) control voltage derived from Voc is compared in a comparator circuit 74 to the sawtooth waveform from the oscillator 72. The comparator 74 puts out a variable duty cycle PWM control voltage onto a PWM control output path 76." As such, the circuit 74 is generating a pulse width modulation (PWM) control. PWM is a variable duty cycle switching technique, wherein a control signal applied to a control gate of a transistor is a logical pulse having a controller duration or duty cycle (Mortazavi, col. 2, lines 2-6). The PWM switching duty cycle can be changed, while maintaining the overall shape of the coil current. As such, Mortazavi's circuit 74 is only for controlling the duty cycle of the PWM. By contrast, a comparator according to Claim 30, shapes the command current waveform to said coil current waveform. For example, in disk drives, coil current shapes maybe selected to perform seek operations that achieve desired acoustics.

Further, Mortazavi does not disclose "a bipolar switch control to receive said command current waveform and to saturate said set of transistors," as required by Claim 30. And, in col. 9, lines 61-63 (relied upon by the Patent Office), Mortazavi does not disclose saturating the set of transistors in any way. Therefore, for these reasons, and the reasons provided above, Applicant submits that the rejection of Claim 30, and its rejected dependent claims, should be withdrawn.

Claims 38-41 and 43 were rejected for substantially the same reasons as Claims 30 and 34-37. The rejection of Claims 38-41 and 43 is traversed for reasons similar to those provided above, and further because in col. 12, lines 20-39 (relied upon by the Patent Office), Mortazavi does not disclose "shaping a command current waveform according to said coil current," as required by Claim 38. Indeed, Mortazavi only describes generating PWM, explained above, and not shaping the command current waveform as required by Claim 38.

Claims 44-46, 48 and 49 were rejected for substantially the same reasons as Claims 30 and 34-41. As such, Claims 44-46, 48 and 49 should be allowed for reasons similar to those provided above.

## VI. Claim Rejections Under 35 U.S.C. § 103(a)

Claim 4 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Mortazavi in view U.S. Patent No. 4,422,027 to Mohlere. This rejection is respectfully traversed because the references, alone or in combination, do not teach all of the limitations of Claim 4. As discussed above, Mortazavi does not disclose all of the limitations of Claim 1. And, as the Patent Office also states, Mortazavi does not teach a VCM having two coils.

Further, Mohlere does not disclose that "said voice coil motor includes a first coil motor and a second coil motor," as required by Claim 4. It is respectfully submitted that in Fig. 2 of

Mohlere, Items Unit 1 and Unit 2 are two different, independent, voice coil motors. Indeed, Mohlere states that: "[t]he controller can handle two motors as is shown in FIG. 2. Each of the two shown control computer (CPU) channels 101 and 100 controls 1 channel ... The Motor(s) get driven by the AMDRIVE signal hh. The Graticule Position Sensor 201 of unit 1 attached to the motor 202 sends back indicating signals ee, ff and gg from which the controller 203 computes position, direction, and velocity information. Unit 2 acts in the same manner as unit 1" (col. 2, lines 34-44).

As such, one of ordinary skill in the art would not look to either Mortazavi/Mohlere or their combination, to achieve the claimed invention. Nor is such a combination suggested in either reference. Even if Mortazavi is to be modified according to Mohlere, as suggested by the Patent Office, the result would be a system with two different VCMs, which has nothing to do with the claimed invention. Further, the two VCMs in such a combined system must be selected one at a time as required by Mohlere: "CHANNEL SELECT g (No. 1/No. 2) determines which of the two motors is to be controlled by front panel" (col. 4, lines 6-8). Therefore, despite the Patent Office's stated motivation, the resulting system with two VCMs will not provide improved velocity control. For at least these reasons, Claim 4 should be allowed.

Claims 50, 57, 58, 61 and 63 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Mohlere in view of U.S. Patent No. 5,838,515 to Hassan et al ("Hassan"). The rejections are respectfully traversed because the references, alone or in combination, do not teach all of the limitations of Claims 50, 57, 58, 61 and 63. As discussed above, Mohlere does not disclose a driver for controlling a voice coil motor having a first coil motor and second coil motor, as required by Claim 50. Mohlere only discloses two different, independent, voice coil motors that can be controlled, one at a time, by a controller.

Further, Hassan does not disclose "an error amplifier to calculate a differential between said velocity voltage and a command voltage" as required by Claim 50. Despite the Patent Office's characterization, in col. 3, lines 20-37, Hassan does not disclose such an error amplifier. Indeed, Hassan states that "a current control device 10, which may be, for example, a part of digital signal processing block 70, supplies an input voltage representative of the desired actuator current. This voltage is filtered by low pass filter 111. Sense amplifier 114 produces an output signal proportional to the actual current passing through actuator 300 by sensing and amplifying the voltage drop across sense resistor 310." (col. 3, lines 12-19). Then, Hassan states that the "error amplifier 112 takes the difference between the output of sense amplifier 114 and the output of low pass filter 111" (col. 3, lines 23-25). As such, there is no velocity voltage sensing in Hassan and there is no use for it by modifying Hassan.

Even further, Hassan does not disclose "a retract amplifier to compensate said command voltage with said differential," as required by Claim 50. In rejecting Claim 50, the Patent Office relies on Item 113 in Fig. 2 of Hassan. However, despite the Patent Office's characterization, there is no teaching in Hassan that Item 113 compensates a command voltage with a differential between the velocity voltage and the command voltage.

The Patent Office further relies on Hassan, col. 5, lines 37-67. However, there is no description therein of a retract amplifier as required by Claim 50. By contrast, in that passage, Hassan states that "... When the supply voltage drops below a threshold level, voltage monitor 133 sends a fault signal to actuator retract block 131.... When actuator retract block 131 receives a fault signal from voltage monitor 133 on input port 131a indicating a loss of supply voltage, an output signal is sent to actuator motor predrive amplifier 113 causing fast retraction of the read head. When a head retract is requested for some non-critical reason, a slower retraction is

desirable so as to avoid potential damage to the read heads caused by sudden acceleration. Thus, when a retract signal is received on input port 131b, actuator retract block 131 sends an output signal to actuator motor predrive amplifier 113 causing slow retraction of the read head."

As such, Hassan cannot use velocity for VCM coil current control. Hassan's error amplifier 113 does not and cannot use a velocity voltage. And, the VCM retract amplifier 131 in Hassan is not a retract amplifier, as required by Claim 50.

Yet further, there is no suggestion or motivation in either Mohlere or Hassan to combine such references. Even if Mohlere is combined with Hassan, the resulting combination does not disclose the claimed invention. This is because such a combination, if operational, may provide control for two different VCMs, and does not compensate a command voltage by a differential between a sensed velocity voltage and a command voltage, as required by the claimed invention. Therefore, for at least these reasons, Applicant submits the rejection of Claim 50, and its rejected dependent claims, should be withdrawn.

Claim 58 was rejected for substantially the same reasons as Claim 50. Rejection of Claim 58 is traversed, for reasons similar to those provided with respect to Claim 50. As such, Applicant submits that Claim 58, and its dependent claims, should be allowed.

With respect to Claim 61, for the above reasons, there is no teaching in Hassan of coupling a retract amplifier to the VCM, wherein the retract amplifier is for compensating the voltage command with the differential voltage between the velocity voltage and the command voltage. Further, the retract block 131 in Fig. 2 of Hassan, relied on by the Patent Office, is not even an amplifier, as presented above. As such, Applicant submits that Claim 61 is in condition for allowance.

With respect to Claim 63, there is no teaching in Hassan that a retract amplifier, functioning as claimed in Claimed 61, is turned on and off as required by Claim 63. Therefore, Applicant submits that Claim 63 is in condition for allowance.

Claims 55 and 56 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Mohlere in view of Hassan as applied to Claim 50, and further in view of Mortazavi. Rejection of Claims 55 and 56 is respectfully traversed because the claims include limitations not taught or suggested by the references, alone or in combination. As discussed, Mohlere or Hassan, alone or in combination do not teach the limitations of Claim 50. Further, there is no suggestion in any of the references to combine them because each has a different goal. A combination of the references is believed to be non-operative. One of ordinary skill in the art would not look to the references to combine them to achieve the claimed invention. As such, Applicant submits that Claims 55 and 56 should be allowed.

## VII. Additional Claim Fees

In determining whether additional claim fees are due, reference is made to the Fee Calculation Table (below).

**Fee Calculation Table**

| | Claims Remaining After Amendment | | Highest Number Previously Paid For | Present Extra | Rate | Additional Fee |
|---|---|---|---|---|---|---|
| Total (37 CFR 1.16(c)) | 100 | Minus | 63 | = 37 | x $18 = | $ 666.00 |
| Independent (37 CFR 1.16(b)) | 16 | Minus | 10 | = 6 | x $84 = | $ 504.00 |

As set forth in the Fee Calculation Table (above), Applicant previously paid claim fees for sixty-three (63) total claims and for ten (10) independent claims. Therefore, Applicant hereby authorizes the Commissioner to charge Deposit Account No. 50-2198 in the amount of $1170.00 for the presentation of thirty-seven (37) total claims over sixty-three (63) and for the

presentation of six (6) independent claims over ten (10). Although Applicant believes that no other fees are due, the Commissioner is hereby authorized to charge Deposit Account No. 50-2198 for any fee deficiencies associated with filing this paper.

## VIII. Conclusion

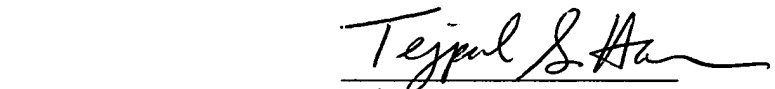
Please address all future correspondence to:

**Tejpal S. Hansra**
**Hansra Patent Services**
**4525 Glen Meadows Place**
**Bellingham, WA 98226**

Applicant believes that the application appears to be in form for allowance. Accordingly, reconsideration and allowance thereof is respectfully requested.

The Examiner is invited to contact the undersigned at the below-listed telephone number regarding any matters relating to the present application.

Respectfully submitted,



Tejpal S. Hansra
Registration No. 38,172
Hansra Patent Services
4525 Glen Meadows Place
Bellingham, WA 98226
(360) 527-1400

Date: April 24, 2003

## VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Specification:

The paragraph beginning on page 4, line 13, has been amended as follows:

According to an embodiment of the present invention, a driver having a current control device for a voice coil [moter] motor in a disk drive is provided. The driver includes a sensor to sense a coil current in the voice coil motor. The driver also includes a transconductance amplifier to detect an error current from the coil current and the command current. The driver also includes a compensator to integrate the error current into the coil current.

The paragraph beginning on page 9, line 19, has been amended as follows:

Microprocessor 12 implements a servo controller program by executing an estimator 38 control loop program. This action [control] controls the current to VCM 20 through digital-to-analog converter 22 and current driver 36. Current driver 36 provides current to VCM 20 through line 35. Microprocessor 12 receives servo position information read by head 30 from media 28. The position information is amplified by pre-amplifier 31 and demodulated by servo channel 25.

The paragraph beginning on page 10, line 17, has been amended as follows:

Fig. 2 depicts a pure torque voice coil motor driver configured to a track following mode in accordance with an embodiment of the present invention. Track following mode indicates that the mechanical assembly is moving the head to follow a

track. A force couple should be created, as disclosed above. Actuator assembly 200 includes VCM 204. Driver 202 provides current and control for VCM 204. Driver 202 may receive commands from a microprocessor and current commands from a DAC to place VCM 204 into different modes or to perform various operations. Driver 202 may be integrated in the power integrated [drip] chip ("IC") that is located on the drive PCB.

The paragraph beginning on page 12, line 3, has been amended as follows:

Driver 202 may desire to know whether the current through VCM 204 is at or about the current specified by current command 230 from the DAC programming. The claimed embodiments of the present invention detect the current within VCM 204 and control the current from amplifiers 216 and 218 to approximate the current defined by current command 230. [Integrator 224 and transconductance] Transconductance amplifier 226 and integrator/compensator 224 [232] detect an error current within VCM 204 and integrate the error current into the command current.

The paragraph beginning on page 13, line 12, has been amended as follows:

By adding the integrator/compensator 224 after the error current is determined, the potential for DC error is reduced. Integrator/Compensator 224 includes a resistor in series with the capacitor. A time constant may be built with integrator/compensator 224, causing a time phase lag.

The Abstract, beginning on page 30, line 2, has been amended as follows:

A driver device and method for pure torque voice coil motor is disclosed. The driver includes a current control device for the voice coil motor. The driver also includes a sensor to sense a coil current to the voice coil motor. The driver also includes a transconductance amplifier to detect an error current from the coil current and a command current. The driver also includes an integrator/compensator to integrate the error current into the coil current. In another configuration, the driver is a driver having a current controller for the voice coil motor in a seek mode. The driver includes a set of transistors coupled to the voice coil motor by a center tap. The set of transistors supply a coil current having a waveform to the center tap. The driver also includes a current sense amplifier to detect the coil current. The driver also includes a comparator to shape a command current waveform to the coil current waveform. The driver also includes a bipolar switch control to receive the command current waveform and to saturate the set of transistors. In another configuration, the driver is a driver for controlling the voice coil motor during retract mode. The voice coil motor has a first coil motor and a second coil motor. The driver includes a sensor to sense a velocity voltage across the second coil motor. The driver also includes an error amplifier to calculate a differential between the velocity voltage and a command voltage. The driver also includes a retract amplifier to compensate the command voltage with the differential.

In the Claims:

Claim 1 has been amended as follows:

1. (Amended) A driver having a current control device for a voice coil motor in a disk drive, comprising:

a sensor to sense a coil current in said voice coil motor;

a transconductance amplifier to detect an error current [from] by comparing said coil current and a command current; and

a compensator to integrate said error current into said coil current.

Claim 12 has been amended as follows:

12. (Amended) The driver of claim [12] 1 , wherein said transconductance amplifier includes a first input and a second input, such that said coil current is coupled to the first input of the transconductance amplifier, and said command current is coupled to the second input of the transconductance amplifier, wherein the transconductance amplifier detects said error current by determining the difference between the coil current and the command current [integrator also includes a capacitor].

Claim 13 has been amended as follows:

13. (Amended) The driver of claim 11 [12], wherein said compensator is coupled to a gain buffer.

Claim 14 has been amended as follows:

14. (Amended) A method for tracking a disk using a voice coil motor coupled to a driver, comprising:

sensing a coil current in said voice coil motor;

determining an error current [from] by comparing said coil current and a command current; and

integrating said error current into said coil current.

Claim 19 has been cancelled without prejudice to, or disclaimer of, the subject matter contained therein.

Claim 27 has been amended as follows:

27. (Amended) The current control device of claim 23, further comprising a current sense amplifier coupled between said sensor and said [integrator] compensator to amplify a voltage across said sensor.

Claim 29 has been amended as follows:

29. (Amended) A driver having a current control device for a voice coil motor, comprising:

an amplifier to drive said voice coil motor with a coil current, said coil current flows from one terminal of said voice coil motor to another terminal, wherein both terminals are coupled to said driver;

a sensor to sense said coil current in said voice coil motor, wherein said sensor is coupled between said amplifier and said voice coil motor;

a current sense amplifier to amplify a voltage across said sensor, wherein said voltage correlates to said coil current;

a transconductance amplifier coupled to said current sense amplifier to receive said voltage and a command current, wherein said transconductance amplifier calculates an error current by comparing the sense current with the command current;

an integrator coupled to said transconductance amplifier to integrate said error current into said command current to determine said coil current.

Claims 64-101 have been added.